

Abstract

Developing graduate attributes in our students and linking research to teaching are key areas for our teaching and learning programmes, and the honours project is a prime area for integrating these into our degree studies. This poster explores how one particular undergraduate project resulted in a refereed paper.

Introduction

A third year practical on a forensic science programme suggested a topic suitable or a potential honours project, and the results from the project were published in a peer-reviewed journal. The published papers now provide reference material for the third year project and provide an exemplar for discussing honour projects with third year students. The exercise thus provides an example for developing research and teaching linkages and demonstrates one way of developing graduate attributes, in particular creative thinking to probe the provisional nature of knowledge.

During the period 2006-2008 one enhancement theme was Research-Teaching linkages as a means of enhancing Graduate Attributes. During that time the Scottish education community examined how academic research informed teaching as well as encouraging undergraduates to research published papers. Healey (1) suggested that linking research to teaching may be more difficult in 'hard' disciplines, and noted the work of Robertson and Blackler (2) where the nature of research and student perception of participation in research varied according to the subject area, with science students tending to perceive research as carried out in laboratories by academic staff.

The case studies reported by Healey and Jenkins (3) also show this trend. Non-science subjects tended to incorporate research as inquiry-based activities whereas science subjects took a more traditional research definition and reviewed published papers or presented original work within an internal forum. However, it may be possible to take undergraduate material and publish it externally, and then feed this back into the undergraduate experience. This project to develop an etching paste is an example of this.

Background to the Honours project

The most common way of identifying ownership or the source of an object is to give it an identification mark. For metallic objects this can be simply achieved by use of die which is forced into the metal. Precious metals are stamped with a hallmark, and cars have Vehicle Identification Numbers (VIN) as well as Registration Plates, and the VIN may be stamped or tagged onto component parts. Firearms too have serial numbers embedded into the metal. When a criminal steals these items he may try to erase or deface the mark. However, in forming the initial mark there has been deformation of the grain structure below the mark, and by careful etching it is possible to recover the identification mark.



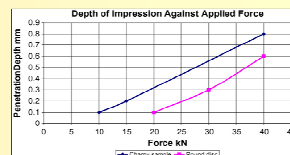
a) Original mark b) defaced mark c) recovered mark

A third year practical on our forensic science programme therefore included etching to demonstrate the technique and to reinforce lectures on metal grain structure. The practical worked well, but demonstrating it every week raised the question whether a paste could be developed as an alternative to a liquid etch. This was therefore offered as potential honours project.

Conduct of the Project

The way honours projects are carried out will vary between institutions and between subjects. In this particular case the title was offered to students and they selected three in order of preference. Staff then allocated projects to optimise everyone's preference, but using students grades as the arbiter when more than one student gave the same priority to a particular topic.

After a preliminary discussion, an outline programme was agreed and it was proposed that the project would include an additional testwork programme to complement the speculative concept of the paste in order to ensure that the student had some results to report. After the initial meeting the supervisor acted as a guide and consultant whilst the student developed her own technique to determine the effect of etching conditions and the effect of varying amounts of metal removal.



d) Effect of applied force on depth of lettering



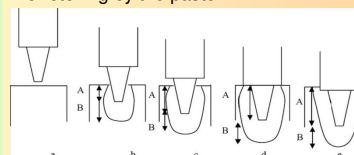
e) Comparison of liquid and paste

Subsequently the student went on to try various methods of producing a paste and the first attempt was surprisingly successful. The student completed her project, got a good grade and graduated with a 2.1.

Beyond the Project

Normally this is where an honours project ends. However, as academics we can often produce a more comprehensive interpretation to the student's results.

In particular the project raised questions as to why the paste often proved better than the liquid, and why stamping pressure affected recovery. By re-examining the student's data and planning a few more tests it was possible to develop a potential model of the metal deformation occurring in the stamping process, and hence the limit for potential recovery. It was also possible to propose a mechanism for etching by the paste.



f) Diagram of metal deformation



g) Chromatographic separation in the paste

The development of the paste was deemed to be of significant value to the forensic science community as well as having potential application in other metallurgical areas. After checking there were no financial considerations to the intellectual property, it was decided to publish in a journal recognised by the profession.

The student was very pleased with having two publications and is now a school chemistry teacher and applying the skills learned in her studies to enthuse the next generation of students. The topic itself has also now gone full circle and the third year practical has been modified to include the results of the research, and to encourage students to think about their own project and where it may lead them.

Conclusion

The honours project is important in developing inquiry-based learning and other graduate attributes such as confidence, creativity, and critical analysis. In many cases results will be discussed in an internal forum, but occasionally a project may produce material that an academic can develop for publication. Such papers are likely to automatically feed back into teaching and thus enhance the student experience.

References

- (1) Robertson, J and Blackler, G (2006) Students' experiences of learning in a research environment. Higher Education Research & Development 25(3) 215-229
- (2) Healey M., Linking discipline-based research and teaching to benefit student learning, Meeting of Institutional contacts and Project Directors, 25 October 2007.
- (3) Healey M. and Jenkins A., Case studies of linking discipline-based research and teaching in disciplines, departments, institutions and national systems, Enhancement themes Resource, February 2007. http://www.enhancementthemes.ac.uk/documents/events/20070308/ResearchTeaching_Case_Studies_AJenkins.pdf